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DEPARTMENTS.

SOLUTIONS OF PROBLEMS.

ARITHMETIC.

165. Proposed by B. F. FINKEL. A.M., M.Sc., Professor of Mathematics and Physics, Drury College.Springfield, Mo.

A borrows $2000 and agrees to pay back principal and interest in 100 equal monthly payments. Find the monthly payment. What would he have to pay yearly on the same conditions in order to discharge the debt in 100 months?

Solution by G. B. M. ZERR, A. M.; Ph. D., The Temple College, Philadelphia, Pa.; J. E. SANDERS. Hackney, O.; M. E. GRABER, Heidelberg University, Tiffin, O.; and G. W. GREENWOOD, A. B., McKendree College, Lebanon, Ill.

As no rate of interest is named we will use 6%, and solve the second part first. 100 months$=8\frac{1}{3}$ years. Let p=principal, r=rate, x=yearly payment. Then $p(1+r)-x$=what remains after first payment; $p(1+r)^2-x(1+r)-x=$ what remains after second payment.

$\therefore p(1+r)^8-x(1+r)^7-x(1+r)^6-\ldots.-x(1+r^2)^2-x(1+r)-x$=what remains after the eighth payment.

$x[1+(1+r)+(1+r)^2+\ldots.+(1+r)^6+(1+r)^7]=[x(1+r)^8-x]/r.$

$\therefore p(1+r)^8(1+\frac{1}{3}r)-x/r[1+r)^8-1](1+\frac{1}{3}r)-\frac{1}{3}x=0.$

$$\therefore x=\frac{pr(1+r)^8(3+r)}{[(1+r)^8-1](3+r)-r}=\frac{120\times 1.5938481\times 3.06}{.5938481\times 3.06-.06}=\$333.069.$$

For monthly payments,

$$x=\frac{pr(1+r)^{100}}{(1+r)^{100}-1}=\frac{2000\times .005(1.005)^{100}}{(1.005)^{100}-1}=\frac{10\times 1.64666849}{.64666849}=\$25.464.$$

ALGEBRA.

168. Proposed by W. J. GREENSTREET, M. A., Editor of The Mathematical Gazette, Stroud. England.

If n, $n+2$, $n+6$, $n+8$, $n+12$ are all primes, find the form of n.

Solution by B. F. FINKEL. A. M., M. Sc., Professor of Mathematics and Physics, Drury College, Springfield, Mo.

Every prime number ends in 1, 3, 7, or 9. Hence, n cannot end in 3, 7, or 9; for, if n ended in 3, $n+2$ would end in 5 and thus be composite; if n ended in 7, $n+8$ would end in 5; if n ended in 9, $n+6$ would end in 5. Hence, n must end in 1, for n greater than 10. Hence, n is of the form $10m+1$. The only value of n less than 10 is 5, the other primes being 7, 11, 13, 17, and 19.

If $m=10$, $n=11$; $n+2=13$, $n+6=17$, $n+8=19$, $n+12=23$.

If $m=100$, $n=101$; if $m=148$, $n=1481$; if $m=1942$, $n=19421$; if $m=2101$, $n=21011$; if $m=2227$, $n=22271$; if $m=4378$, $n=43781$, etc.